

RESEARCH FOR THE SCREW-WORM ERADICATION PROGRAM

Conducted by Entomology Research Division
with currently available funds.

A. Animal protectant treatments (Harrville)

1. Sprays.

Preliminary research has shown that Bayer 21/199 destroys screw-worms in wounds and protects animals against infestations for 10 days or longer when applied as an over-all body spray. Such a treatment would be of enormous value to the eradication program in Florida because (1) spraying with protectant materials on a large scale would reduce screw-worm production in livestock and make more certain the eradication of the pest by the sterilized male technique. It has been demonstrated that the greater the ratio of sterile to normal insects, the better the chances of success, and (2) the treatment of imported livestock at quarantine points would greatly minimize the introduction of the fly into the southeast.

- a. Special emphasis will be given to evaluating 21/199 on various classes of animals under different types of conditions.
- b. Studies will be initiated on formulations designed to prolong the effectiveness of the sprays on various kinds of livestock. Materials will be added to sprays to prevent washout by rainfall, to resist the deteriorating effect of sunlight, wind, etc. and to make the preparation more insecticidally effective.
- c. Simplify application techniques. Test the application of protectants by means of drifting sprays or aerosols and dusts. Special formulations will no doubt be required. Emulsions, special oil solutions or stickers will be given attention.
- d. Toxicological safety and residues. Studies will be initiated to determine toxicity and residue hazards under multiple spray applications. Preliminary work indicates one spraying is safe and leaves little residue in meat animals but secretes in the milk slightly. In order to use 21/199 as an adjunct to eradication in Florida, it is urgent to know if sprays applied at 1, 2 or 3 week intervals present toxicological hazards. If financial support in the form of a grant in aid cannot be obtained

Check
spray -
on swine.

- d. (continued) from the manufacturers of this compound or from the Screw-worm Eradication Program, the toxicological effects will progress at a very slow rate and information will not be available for 2 years.
- e. Final field tests with 21/199 will be made jointly with the Methods Development Group of the eradication program to evaluate the sprays under Florida conditions.
- f. A screening program will be strengthened to find and develop more effective and lower cost insecticides for use in animal protectant sprays against screw-worm.

2. Wound treatments.

Some recent work indicates that a more effective wound dressing than BQ-335 can be developed.

- a. Evaluate 21/199, Dow EP-57 and other promising insecticides as wound treatments on various classes of livestock under a variety of farm and ranch conditions.
- b. Initiate research on improved wound dressing formulations.
- c. Test the best wound treatment in large scale field tests in Florida cooperatively with the Methods Development Group of the Screw-worm Eradication Program.
- d. Determine toxicity and possible residue hazards of 21/199 and other promising materials when used as wound treatments.

B. Oviposition attractants, trap baits and sterilization studies (Orlando).

A small staff will continue basic investigations to do research helpful to the eradication effort and carry out specialized investigations which could not be conveniently fitted into the methods development program of the Animal Disease Eradication Division. The rearing of screw-worms for these experiments will terminate when it is determined that accidental escape of flies might endanger the eradication effort.

Our investigators have already put much effort into attractant studies. Incubation of meat juices produces a substance which stimulates oviposition by the laboratory strains of flies, but, so far, it has not been effective in tests with flies in nature. Chemical investigations suggest that the attractant can be concentrated. An attractant would greatly simplify the problem of getting adequate samples of egg masses to appraise the effects of releasing sterilized flies. Also such an attractant might prove a much better bait for fly traps than liver which is currently used. An improved bait would add greatly to the value of fly traps for estimating screw-worm populations, especially in areas such as the everglades and off-shore

islands where domestic animals are scarce, but screw-worm breeding in wildlife may produce high populations.

1. Oviposition attractants.

a. Intensified efforts will be made to evaluate incubated meat juices under field conditions by applying material in different types of formulations to animals, artificial meat devices, and other ways to simulate wounds on animals.

b. In cooperation with chemists, attempt to concentrate the meat juices and make them more efficient by formulation.

2. Trap baits.

a. Incorporate incubated meat juices with liver and other baits to use in screen wire fly traps, to trap flies for index purposes.

3. Sterilization.

It is proposed that released flies be sterilized by irradiating pupae with 7,500 r ($\pm$ 10 percent) of gamma rays. Probably irradiation with 10,000 r would be no more harmful to the flies and might be desirable as an added margin of safety in the final months of the eradication campaign.

a. Initiate laboratory tests on the longevity of sterilized flies and the competitive mating activity of sterilized males to determine if this higher dosage can be recommended for field trial in one of the release areas. A few months work would be sufficient to establish whether 10,000 r was more harmful to the flies than 7,500 r.

The salaries released by transfer of the present screw-worm research employees to the eradication group will be utilized at Kerrville.

RESEARCH NEEDS FOR THE SCREW-WORM ERADICATION PROGRAM

A. Animal Protectants (Kerrville)

This subject was discussed on pages 47 and 48 of the Entomology Research Division report dated March 22, 1957, and entitled "Operational Procedures and Estimated Requirements in the Conduct of a Screw-worm Eradication Program in the Southeastern United States." Special attention was called to encouraging results with Bayer 21/199 and it was suggested, if ~~\$25,000~~ could be made available to the Kerrville laboratory to cover extra expenses for intensified research, that Kerrville could develop a livestock protectant spray *adequately supported* by the end of fiscal year 1958. *Probably*

Sprays for Experiment

In anticipation of an eradication program, the Kerrville laboratory diverted activities from some of its other projects and concentrated efforts to field-test 21/199 during the past summer. A total of 11,067 sheep with shear-cuts, 408 sheep and goats with other wounds, 515 head of screw-worm-infested cattle and 3 horses were treated with sprays in comparison with the standard EQ 335. The results showed that 0.5 percent 21/199 spray was far superior to the presently recommended EQ 335. In general, most sprayed animals healed without further infestation and those that became infested had been protected 10 days or longer. There were only a few cases of less than 10 days protection and these were associated with new, bloody wounds on previously sprayed animals.

Some work has been done on incorporating 21/199 in a wound dressing similar to EQ 335. Formulations studies will be completed this fall and winter to develop smears for field tests next spring. Since as much as 3 percent of 21/199 may be incorporated in a smear for wound treatment, it should protect that limited area better than a 0.5 percent spray applied over the entire body.

The research has indicated that routine spraying of susceptible livestock will protect animals from infestation. Further experiments have to be made to determine the frequency of spraying required. When a protective spray treatment is developed it should be of value if used by Florida ranchers to prevent breeding in sprayed herds and thus limit the native fly population to that breeding in neglected stock and wild animals.

Toxicological research has indicated the safety of single sprays and data from chemical and radiometric studies show that

Initial Observations (Continued)

This subject was discussed on pages 17 and 18 of the Entomology Research Division report dated March 25, 1957, and entitled "Observations on the Behavior and Feeding Habits of the Cotton-leafhopper, *Leptocorisa oratoria*, in the Southeastern United States." Special attention was called to the following results with regard to the behavior of the cotton-leafhopper on cotton plants, and it was suggested, if possible, to conduct further research in this area to cover other aspects for information. This research could develop a livestock protection spray.

In addition to the collection of the cotton-leafhopper, the laboratory observed activities from some of the other insects and recorded the results of the tests. During the past season, a total of 11,000 insects were collected, 100 sheep and goats with other animals, 25 head of cotton-leafhopper-infested cattle and 2 horses were treated with sprays in the laboratory with the chemical 2,4-D. The results showed that 0.5 percent 2,4-D spray was the most effective for the present. The results of the tests on the cotton-leafhopper and other insects indicated that the cotton-leafhopper is the most dangerous to the cotton plant. In the case of the other insects, the results were not as significant. With new, highly resistant cotton plants, the cotton-leafhopper is the most dangerous.

Some work has been done on the cotton-leafhopper in a small amount of time. The cotton-leafhopper is the most dangerous to the cotton plant. In the case of the other insects, the results were not as significant. With new, highly resistant cotton plants, the cotton-leafhopper is the most dangerous.

The research has indicated that further spraying of susceptible insects will prevent serious loss of cotton. Further experiments have to be made to determine the frequency of spraying required. A protective spray treatment is developed to protect the cotton plant from the cotton-leafhopper. The results of the tests on the cotton-leafhopper and other insects indicated that the cotton-leafhopper is the most dangerous to the cotton plant. In the case of the other insects, the results were not as significant. With new, highly resistant cotton plants, the cotton-leafhopper is the most dangerous.

Technical research has indicated the safety of single sprays and that the chemical and technical results show that

single treatments do not constitute a residue hazard. However, toxicity and residue studies have not yet been made to determine the effects of repeated treatments with 21/199. Before repeated applications of 21/199 treatments can be recommended, we must have data to show that they are harmless to livestock and do not cause a meat residue hazard. These chemical and toxicological studies should not be difficult because the Kerrville laboratory is already equipped and staffed and the results with single treatments suggest that repeated treatments should prove safe.

It is proposed that research on animal protectant treatments be conducted in Texas to perfect formulations, establish entomological efficiency, toxicological safety and lack of residue hazard. Final field tests to check performance under Florida conditions would be made ~~by Kerrville entomologists on temporary assignment in Florida.~~ *jointly with the methods development group of ADED*

~~If the salaries released by transfer of present screw-worm research employees to Animal Disease Eradication Division can all be utilized at Kerrville, the research can be conducted on schedule. The proposed organization and estimated expenses for these investigations are shown in the following tabulation:~~

SCREW-WORM RESEARCH

Animal Protectants--Kerrville

Bushland, R. C.	GS-13 Entomologist (quarter-time)	\$ 2,588
Brundrett, H. M.	GS-9 Entomologist (half-time)	3,340
Richards, R.	GS-9 Entomologist (half-time)	2,996
Alford, H. C.	GS-7 Entomologist	5,000
Drake, J. H.	GS-5 Biological Aid	4,568
Kott, D. H.	WE Laborer IV	3,793
<i>Request that ADED pay for two subprofessionals</i>		\$ 22,285
L/A for field tests in Kerrville area, Texas Gulf Coast, and Florida		5,000
L/A for toxicology		
Effects of repeated spraying with 21/199		2,000
Development of non-irritating and safe wound dressings		1,000
		8,000
Total expenditures at Kerrville		\$ 30,285

Other expenditures not tabulated:

Graham, O. H., GS-12 Entomologist--Supervisory, directing Texas studies while Bushland is in Florida.
 Radeleff, R. D., GS-13 Veterinarian, ADP--Toxicology
 Claborn, H. V., GS-12 Chemist--Tissue analyses and formulation of wound dressings.

Time of these men and their staffs not estimated but with 21/199 and other protectant sprays would be an important part of their program.

Also not estimated are contributions of R. O. Drummond, GS-9 entomologist--full time on systemic insecticides with at least 1/3 of effort on screw-worms.

No estimate on clerical and fiscal duties at Kerrville.

No estimate on work of ranch staff at Kerrville.

No estimate on vehicles used for field work.

No estimate on physical plant and animal maintenance overhead at Kerrville although screw-worm research would use about 1/3 of the resources of the station.

